

THE VASCULAR FLORA OF NASH PRAIRIE: A COASTAL PRAIRIE REMNANT IN BRAZORIA COUNTY, TEXAS

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ABSTRACT

An intensive survey of the vascular flora of Nash Prairie, a ca. 120 ha Coastal Prairie remnant in Brazoria County, Texas, resulted in a checklist of 311 species of vascular plants representing 63 families and 197 genera. The seven families containing the most species are Poaceae (70), Cyperaceae (37), Asteraceae (46), Fabaceae (17), Euphorbiaceae (10), Apiaceae (7), and Scrophulariaceae (7). Rich native genera include *Carex* (11 spp.), *Cyperus* (9 spp.), *Juncus* (7 spp.), *Panicum* (7 spp.), and *Paspalum* (7 spp.). Non-native species account for only 7% of the total, 50% (11) of which are grasses. The native flora comprises 289 species distributed in 63 families. The native grass flora includes 59 species in five subfamilies, 71% of which were C_4 species, with most of these belonging to the Panicoideae (35 spp.). Noteworthy collections of globally and regionally rare species and species with temperate amphitropical distributions from Nash Prairie are discussed, and an annotated checklist of vascular plants is provided. This research suggests previous estimates of species richness for climax Coastal Prairie in Texas are low and that historic and potential losses of botanical diversity are greater than previously thought.

RESUMEN

Un seguimiento intensivo de la flora vascular de Nash Prairie, de unas 120 ha de restos de pradera costera en Brazoria County, Texas, dio como resultado un listado de 311 especies de plantas vasculares de 63 familias y 197 géneros. Las siete familias con mayor número de especies son Poaceae (70), Cyperaceae (37), Asteraceae (46), Fabaceae (17), Euphorbiaceae (10), Apiaceae (7), y Scrophulariaceae (7). Los géneros nativos ricos en especies incluyen *Carex* (11 spp.), *Cyperus* (9 spp.), *Juncus* (7 spp.), *Panicum* (7 spp.), y *Paspalum* (7 spp.). Las especies exóticas son sólo el 7% del total, siendo el 50% (11) gramíneas. La flora nativa comprende 289 especies distribuidas en 63 familias. Las gramíneas nativas incluyen 59 especies de cinco subfamilias, de las que el 71% son especies C_4 , perteneciendo la mayoría de ellas a las Panicoideae (35 spp.). Se discuten las colecciones notables de especies raras tanto a nivel regional como global y las especies con distribución templada y amfitropical de Nash Prairie, y se aporta un catálogo de las plantas vasculares. Esta investigación sugiere que las estimaciones previas de riqueza de especies de la climax de la Coastal Prairie de Texas son bajas y que las pérdidas históricas y potenciales de diversidad botánica son mayores de lo que se había pensado antes.

INTRODUCTION

The original extent of the Coastal Prairie region encompassed ca. 3,800,000 ha extending from southcentral Louisiana to south Texas along the northwestern Gulf of Mexico, and contributed about 1% to the total of all major grassland types of the contiguous United States (Sims & Risser 2000). Most of the original vegetation of the Coastal Prairie has been altered by overgrazing, conversion to various agricultural uses, encroachment of woody vegetation due to fire protection, or destroyed by industrial, commercial, and residential development (Diamond & Smeins 1984; Smeins et al. 1991; Sims & Risser 2000). The Coastal Prairie was characterized in detail by Smeins et al. (1991), and divided in Texas into an upper and lower section based on variation in soil and climate (Diamond & Smeins 1984). A full account of the flora of the Coastal Prairie would be difficult to compile since 99% of the original vegetation has been destroyed and the best and largest remaining remnants occur on private property. Several years ago, I was presented with the opportunity to survey a relatively large and intact example of this rare plant community.

METHODS

Nash Prairie is a ca. 120 ha remnant Coastal Prairie on the Kittie Nash Groce (KNG) Ranch. Nash Prairie is managed as a native hay meadow and has been maintained for decades by frequent mowing, haying, and burning. The entire prairie is seldom dry enough to burn or hay all at once, which results in a random

pattern of disturbance across the landscape. The topography of Nash Prairie is intact and includes wetland depressions and abandoned stream meanders, numerous pimple mounds, and inter-mound flats (Fig. 1). Discussions with KNG Ranch personnel revealed that the prairie has probably never been subjected to overgrazing, and the native sod has never been broken. Access for an intensive floristic survey was arranged through cooperation between the KNG Ranch and the Nature Conservancy of Texas.

Nash Prairie is located in southwest Brazoria County, Texas, ca. 35 km south of the Houston metropolitan area (Fig. 2). The prairie is bounded on all sides by agricultural land subject to various uses, including rice and row crop farming, improved pasture, and grazing. A barbed-wire fence along the south, west, and north boundaries accounts for some of the woody species that occur in the annotated checklist. Nash Prairie occurs roughly in the geographic center of the Upper Coastal Prairie region, which lies within the Coastal Plain Province at the northern limit of the subtropical vegetation zone (Fenneman 1928; Good 1953). The regional climate is moist subhumid mesothermal characterized by long hot summers and mild winters (Thorntwaite 1948). Average annual rainfall is 132 cm, with 60% occurring from April through September (Crenwelge et al. 1981). The average daily summer temperature is 27°C, and average daily winter temperature is 13°C (Crenwelge et al. 1981).

Soils mapped in Nash Prairie are Edna fine sandy loam and Edna-Aris complex (Crenwelge et al. 1981). The Edna-Aris complex is generally associated with older stream meanders and is distinguished by the distinctive pimple mounds, with Aris fine sandy loam soils occupying the mounds, and Edna clayey soils occurring on the flats in between (Crenwelge et al. 1981). Pimple mounds are characteristic of remnant Coastal Prairie sites which are topographically intact, and they are a reliable indicator that the native sod is unbroken. Pimple mounds, like prairie wetlands (Fig. 3), also provide a microhabitat differing in soil texture, slope, soil moisture and elevation from the surrounding landscape.

Collecting trips were made to the prairie from August 2003 through September 2006. The prairie was visited on average three times a month from March to October throughout the study with the exception of a single visit in December, 2005. A complete set of voucher specimens are housed at the University of Texas at Austin Plant Resources Center Herbarium (TEX). Some duplicate specimens can also be found at BRCH, BRIT, MICH, SBSC, TAES, VSC and US (acronyms follow Holmgren et al. 1995). Plant identifications were made using the *Flora of North America* (2000; 2002a; 2002b; 2003) and various regional manuals, including Correll and Johnston (1970), Gould (1975), Isely (1990), and Smith (1994).

RESULTS AND DISCUSSION

This research resulted in collections of 311 species of vascular plants representing 63 families and 197 genera (Table 1; Appendix I). The seven families containing the most species are Poaceae (70), Cyperaceae (37), Asteraceae (46), Fabaceae (17), Euphorbiaceae (10), Apiaceae (7), and Scrophulariaceae (7). Rich native genera include *Carex* (11 spp.), *Cyperus* (9 spp.), *Juncus* (7 spp.), *Panicum* (7 spp.), and *Paspalum* (7 spp.). Non native species accounted for 7% of the total species, 50% (11) of which were grasses. A subjective estimate of the dominant and sub-dominant species of climax plant assemblages occurring at various landscape positions is presented in Table 2. This is meant to aid managers and restorationists by providing lists of target species for different cover types from a relatively intact Coastal Prairie remnant. During the study, species occurrence and dominance varied seasonally, and dominance roles appeared to shift with seasonal and annual precipitation patterns and disturbance from mowing and haying. Because mowing and haying occurred sporadically across the site during the study years, it is difficult to know what role disturbance played in the distribution and abundance of species in each cover type. Long-term quantitative vegetation studies at Nash Prairie are greatly needed.

Infrafamilial Diversity in Poaceae

The native grass flora of Nash Prairie includes 59 species in five subfamilies and comprises 71% C₄ species (Table 3). As indicated by Smeins et al. (1991) for the Coastal Prairie, the native grass flora of Nash Prairie



FIG. 1. Aerial photograph of Nash Prairie (boundary outlined in white), Brazoria County, Texas.

is dominated by the Panicoideae. The greatest number of C_4 taxa also belong to the Panicoideae (33 spp.), followed by the Chloridoideae (14 spp.; Table 3). Sixty-four percent of the introduced grass species found use the C_4 photosynthetic pathway, including potentially aggressive species such as *Cynodon dactylon*, *Paspalum dilatatum*, *P. notatum*, *P. urvillei*, and *Sorghum halepense*. The dominance of C_4 species in the Coastal Prairie is expected given their competitive advantage over C_3 species in a subtropical climate regime (Diamond & Smeins 1988).

Endemic and Rare Taxa

This survey yielded collections of several rare or otherwise noteworthy taxa. Species with distributions limited to the Coastal Prairie or with the greatest extent of their range occurring therein include *Amsonia repens*, *Asclepias linearis*, *Cooperia traubii*, *Euphorbia texana*, *Liatris bracteata*, *Rudbeckia texana*, and *Thalictrum texanum* (Correll & Johnston 1970). Species that are regionally rare and previously unreported from the Coastal Prairie (including some significant range extensions from collections previously mapped by Turner et al. 2003a; Turner et al. 2003b) include the Great Plains *Eleocharis compressa* var. *acutisquamata* and the eastern species *E. wolfii*, *Scleria muhlenbergii*, *Juncus elliotii* var. *elliotii*, and *Sporobolus silveanus*. Diamond and Smeins (1985) described a novel *S. silveanus*-*Carex meadii* grassland type from the northern end of the Blackland Prairie. The occurrence of members of this same assemblage at Nash Prairie suggests this community type might have been more widespread prior to European settlement.

Several species with temperate amphitropical distribution are known from the Coastal Prairie region

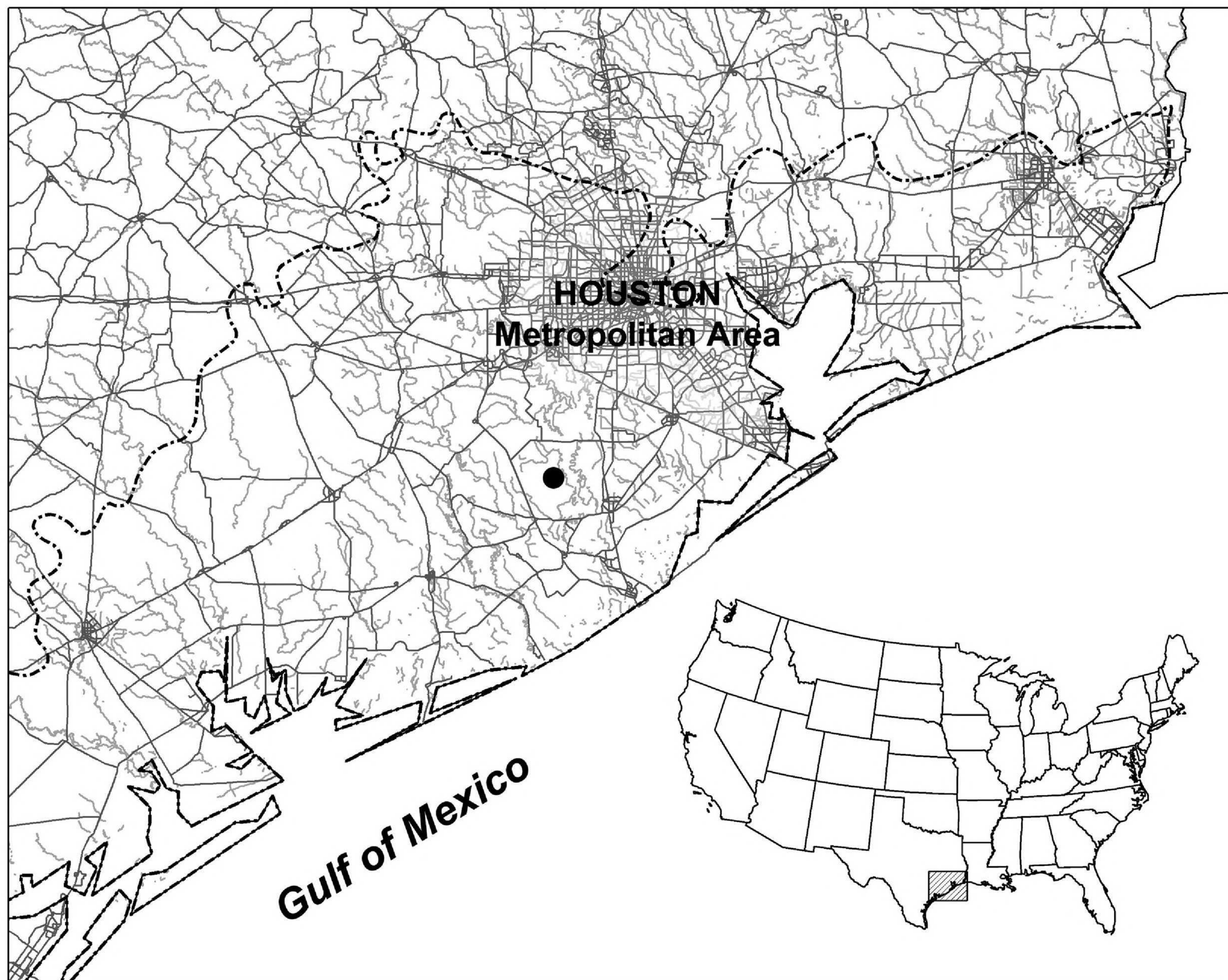


FIG. 2. General location of Upper Coastal Prairie of Texas (dashed-dotted line) and Nash Prairie (!).

and are considered by most botanists to be native taxa with disjunct distributions. Raven (1963) suggested a late Pliocene or Pleistocene introduction by long range dispersal for temperate amphitropical disjuncts in North America and considered coastal, seasonally wet, and/or open weedy grassland habitats particularly suitable for disjuncts to establish. Several amphitropical disjuncts listed by Raven (1963) occur at Nash Prairie, including *Soliva sessilis* [as *S. pterosperma* (Juss.) Less.], *Hordeum pusillum*, *Phalaris angusta*, *Lepuropetalon spathulatum*, and *Proserpinaca palustris*. The following discussion provides details of other amphitropical elements of the Coastal Prairie.

Bothriochloa exaristata is a relatively rare species known from sites with heavy soils in the Coastal Prairie of Texas and Louisiana, with a disjunct distribution in coastal areas of southern Brazil and adjacent Argentina, inland to Paraguay (Gould 1975; Allred 2003). Tucker et al. (2003) suggested that *Cyperus cephalanthus* might be naturalized in the United States. However, more detailed accounts support *C. cephalanthus* as a temperate amphitropical disjunct and a reliable indicator of undisturbed Coastal Prairie remnants in Texas and Louisiana (Carter & McInnis 1993; Grace et al. 2000). Collections of *C. cephalanthus* from Nash Prairie are only the second reported (and the only extant population known) in Texas since the type specimen was collected near Galveston Bay (Rosen & Christoffersen 2004). *Cyperus drummondii* is another reliable indicator of Coastal Prairie remnants in Texas and Louisiana, as well as other undisturbed habitats in the southeast United States (Carter et al. 1999; Rosen 2004). *Panicum bergii* is distributed in eastern South America and southeastern Texas. Although Gould (1975) considered *P. bergii* to be introduced, Correll and



FIG. 3. Examples of wetland habitats at Nash Prairie, Brazoria County, Texas. Foreground is an abandoned stream meander dominated by *Panicum hemitomon* with adjacent lowland prairie dominated by *P. virgatum* (photo by Marty Underwood).

TABLE 1. Taxonomic summary of vascular plants of Nash Prairie, Brazoria County, Texas.

Group	Species Families	Genera	Native	Non-native	Total
Monocots	13	58	117	14	131
Eudicots	50	139	172	8	180
Totals	63	197	289	22	311

Johnston (1970) suggested it might be bicentric in distribution. *Panicum bergii* has been established in the flora of the Coastal Prairie for some time, has a similar distribution to other amphitropical species, and does not appear to be aggressive. *Paspalum wrightii* occurs in Cuba, Mexico (Campeche), Bolivia, Paraguay, and Argentina (Allen & Hall 2003). Along the upper Texas coast *P. wrightii* occurs in prairie wetlands, where it has probably frequently been confused with *Paspalum plicatulum*. Although *Cuphea glutinosa* is considered native to South America, my experiences with this species have been restricted to late successional vegetation in Coastal Prairie remnants in Louisiana and Texas, suggesting it is also native to the flora. Temperate amphitropical distributions have been reported for other grassland species, indicating floristic disjunctions might have played a role in the development of the Coastal Prairie flora, in addition to other origins reported by Smeins et al. (1991).

Invasive Species

Most introduced species at Nash Prairie were encountered along a paved public road that bounds the prairie to the East and unimproved roads that provide access for farm equipment into the prairie (Fig. 1). Several

TABLE 2. Subjective estimate of dominant and sub-dominant species of climax plant assemblages occurring at various landscape positions in Nash Prairie. Species occurrence and dominance varied seasonally and across study years. Species are listed in alphabetical order.

WETLANDS	
<i>Semi-permanently flooded depressions</i>	
<i>Eleocharis quadrangulata</i>	<i>Polygonum hydropiperoides</i>
<i>Hydrolea ovata</i>	<i>Pontederia cordata</i> var. <i>cordata</i>
<i>Hymenocallis liriosme</i>	<i>Proserpinaca palustris</i> var. <i>amblyogona</i>
<i>Iris brevicaulis</i>	<i>Rhynchospora corniculata</i>
<i>Juncus effusus</i> var. <i>solutus</i>	<i>Sagittaria graminea</i> subsp. <i>graminea</i>
<i>Juncus nodatus</i>	<i>Sagittaria papillosa</i>
<i>Panicum hemitomom</i>	<i>Sesbania drummondii</i>
<i>Paspalidium geminatum</i>	<i>Thalia dealbata</i>
<i>Paspalum wrightii</i>	
 <i>Seasonally wet lowland prairie</i>	
<i>Amsonia repens</i>	<i>Juncus elliotii</i> var. <i>elliotii</i>
<i>Arnoglossum plantagineum</i>	<i>Lobelia puberula</i>
<i>Axonopus fissifolius</i>	<i>Neptunia lutea</i>
<i>Boltonia diffusa</i> var. <i>diffusa</i>	<i>Panicum rigidulum</i> subsp. <i>rigidulum</i>
<i>Carex festucacea</i>	<i>Panicum tenerum</i>
<i>Carex longii</i>	<i>Panicum virgatum</i>
<i>Carex tetrastachya</i>	<i>Paspalum floridanum</i>
<i>Carex triangularis</i>	<i>Paspalum praecox</i>
<i>Cyperus drummondii</i>	<i>Rhynchospora caduca</i>
<i>Cyperus virens</i> var. <i>virens</i>	<i>Rhynchospora globularis</i>
<i>Eleocharis compressa</i> var. <i>acutisquamata</i>	<i>Rudbeckia texana</i>
<i>Euthamia gymnospermoides</i>	<i>Tridens strictus</i>
<i>Helianthus angustifolius</i>	<i>Tripsacum dactyloides</i> var. <i>dactyloides</i>
<i>Juncus brachycarpus</i>	<i>Vernonia missurica</i>
 UPLANDS	
<i>Upland prairie (incl. pimple mounds)</i>	
<i>Acacia angustissima</i> var. <i>hirta</i>	<i>Liatris pycnostachya</i>
<i>Andropogon gerardii</i> subsp. <i>gerardii</i>	<i>Mimosa hystricina</i>
<i>Andropogon ternarius</i> var. <i>ternarius</i>	<i>Muhlenbergia capillaris</i>
<i>Aristida purpurascens</i> var. <i>purpurascens</i>	<i>Paspalum plicatulum</i> var. <i>plicatulum</i>
<i>Arnoglossum plantagineum</i>	<i>Polytaenia nuttallii</i>
<i>Baptisia bracteata</i> var. <i>leucophaea</i>	<i>Schizachyrium scoparium</i> var. <i>scoparium</i>
<i>Baptisia sphaerocarpa</i>	<i>Scleria ciliata</i> var. <i>elliotii</i>
<i>Carex bushii</i>	<i>Scleria pauciflora</i> var. <i>pauciflora</i>
<i>Carex meadii</i>	<i>Silphium gracile</i>
<i>Croton glandulosus</i> var. <i>lindheimeri</i>	<i>Solidago stricta</i>
<i>Cyperus echinatus</i>	<i>Solidago tortifolia</i>
<i>Dichanthelium aciculare</i> subsp. <i>angustifolium</i>	<i>Sorghastrum nutans</i>
<i>Eragrostis spectabilis</i>	<i>Symphyotrichum dumosum</i>
<i>Eryngium yuccifolium</i>	<i>Symphyotrichum ericoides</i> var. <i>ericoides</i>
<i>Fimbristylis puberula</i> var. <i>puberula</i>	<i>Tephrosia onobrychoides</i>
<i>Liatris acidota</i>	

species observed to disperse from disturbed sites into existing prairie vegetation include *Cyperus entrerianus*, *Paspalum urvillei*, *Sorghum halepense*, and *Triadica sebifera*. A good deal of research has been published on the invasive potential of *T. sebifera* in the Coastal Prairie of Texas and Louisiana (e.g., Bruce et al. 1997; Barrilleaux & Grace 2000). However, little attention has been given to other species that appear to be invasive in established vegetation in the Coastal Prairie region.

TABLE 3. Distribution of grass taxa and C₄ photosynthetic pathway by Subfamily for Nash Prairie, Brazoria County, Texas. Subfamilial classification follows the Catalogue of New World Grasses (Judziewicz et al. 2000; Peterson et al. 2001; Soreng et al. 2003; Zuloaga et al. 2003).

Subfamily	Genera	Species		%C ₄ Species	
		Introduced	Native	Introduced	Native
Aristidoideae	1	0	1	–	100
Chloridoideae	7	2	12	100	100
Ehrhartoideae	1	0	1	–	100
Panicoideae	17	5	35	100	80
Pooideae	11	4	10	0	0

CONCLUSIONS

This research reports numerous taxa not previously cataloged in early descriptions of the Coastal Prairie (e.g., Bray 1906; Tharp 1926) or more recent accounts of the flora of the Upper Coastal Prairie (e.g., Butler 1979; Smeins et al. 1991). Indeed, the flora of the Coastal Prairie probably includes many more species not reported herein or previously by other authors. Given the overall geological and environmental diversity of the region (Smeins et al. 1991), the flora might approach ca. 600 species (Allain & Johnson 1997; Allen et al. 2001; D. J. Rosen, unpublished data & personal observation). Only continued intensive floristic research in remnants of Coastal Prairie will provide an accurate estimate. I believe that both historic and potential losses of botanical diversity in the Coastal Prairie are greater than previously thought. As this research has indicated, numerous plant taxa with their distributions centered in other habitat types extend into the Coastal Prairie. It has been suggested that the conservation of potentially genetically distinct populations is at least as important as the conservation of an entire species (Ehrlich 1988). Expanding populations in the Upper Coastal Prairie region, rapid urbanization of rural areas, a continued poor understanding of the flora, and the lack of an aggressive strategy for Coastal Prairie conservation could result in the loss of the remaining large remnants. The approach of ex-situ preservation of a few endangered Coastal Prairie plant and animal species will have little environmental value in the absence of large areas of suitable habitat (Jordan 1988).

APPENDIX 1

ANNOTATED CHECKLIST OF SPECIES

Families are arranged alphabetically, beginning with monocots, and followed by eudicots, following the classification presented in APGII (2003). Genera, species, and infraspecific names are arranged alphabetically under families and their classification generally follows Jones et al. (1997) with a few exceptions. Recent molecular data supports the recognition of *Dichantheium* as a genus distinct from *Panicum* (Freckmann & Lelong 2003). I also follow APGII (2003) in considering Apocynaceae to include Asclepiadaceae. Some species names are preceded by special symbols to indicate nativity and conservation interest as follows: (1) non-native species are indicated by an asterisk (*), based on review of Hatch et al. (1990) and Correll and Johnston (1970); (2) endemic, rare, or regionally rare species are indicated by a superscript dagger (†), based on review of Correll and Johnston (1970), Turner et al. (2003a; 2003b), or personal experience; and (3) amphitropical species are indicated by a superscript bold capital **AT**. Synonyms, if considered useful, are provided in brackets following the species name. Following each name is an abbreviation from Palmer et al. (1995), representing one of the following subjective estimates of the relative abundance of that species in the particular habitat(s) where it was collected: **r** = rare (very difficult to find and limited to one or very few locations or uncommon habitats); **i** = infrequent (difficult to find with few individuals or colonies but found in several locations); **o** = occasional (widely scattered but not difficult to find); **f** = frequent (easily seen or found in one or more common habitats but not dominant in any common habitat); and **a** = abundant (dominant or codominant in one or more common habitats). Following the relative abundance, the habitat(s)

where that species is typically found is indicated by the following general categories: **Prairie** = Infrequently flooded to upland elevation grassland throughout the study area; **Wetlands** = All wetland sites, including deep, seasonally flooded depressions and abandoned stream meanders and temporarily flooded inter-mound flats and lowland prairie; **Pimple mounds** = Distinctive circular mounds of various elevations and diameters that occur throughout the site; **Disturbed** = Sites where the native sod has been disturbed, including dirt roads, roadside ditches, and fence-lines with encroaching woody vegetation.

The abundances and habitat preferences indicated are based on my observations during the duration of this research. They may reflect the response of each species to management of Nash Prairie and recent rainfall conditions, but they are not meant to indicate the expected dominance or habitat preference for each species throughout the Coastal Prairie. Collection numbers are mine with the exceptions of a few specimens collected by William R. Carr (WRC). Annotations for grasses are followed with their designation as either C₃ or C₄ following Waller and Lewis (1979). Global and state conservation ranks following Carr (2004) are provided for some rare taxa.

MONOCOTS

Agavaceae

Manfreda virginica (L.) Salisb. ex Rose, prairie, i, 3004

Alismataceae

Sagittaria graminea Michx. subsp. *graminea*, wetlands, f, 2707

Sagittaria papillosa Buchenau, wetlands, i, 2859

Alliaceae

Nothoscordum bivalve (L.) Britton, prairie, f, 2690

Amaryllidaceae

†*Cooperia traubii* W. Hayw., prairie, i, 3155, G3QS3

Hymenocallis liriosme (Raf.) Shinners, wetlands, o, 2713

Commelinaceae

Commelina erecta L. var. *deamiana* Fernald, disturbed, i, 2923

Tradescantia ohiensis Raf., disturbed, pimple mounds, i, 2712

Cyperaceae

Carex bushii Mack., prairie, i, 2875

Carex cherokeeensis Schwein., prairie, o, 2717

Carex complanata Torr. & Hook., prairie, i, 2746

Carex festucacea Schkuhr ex Willd., wetlands, i, 2763

Carex flaccosperma Dewey, prairie, i, 2765

Carex leavenworthii Dewey, wetlands, r, 3659

Carex longii Mack., wetlands, i, 2848

Carex meadii Dewey, prairie, pimple mounds, a, 2688

Carex microdonta Torr. & Hook., prairie, i, 4048

Carex tetrastachya Scheele, wetlands, o, 2766

Carex triangularis Boeck., wetlands, o, 2764

**Cyperus articulatus* L., wetlands, i, 2899

†^{AT}*Cyperus cephalanthus* Torr. & Hook., wetlands, r, 2950, G2QS1

Cyperus croceus Vahl, disturbed, pimple mounds, i, 2949

†^{AT}*Cyperus drummondii* Torr. & Hook., wetlands, o, 2631

Cyperus echinatus (L.) Alph. Wood, prairie, o, 3013

**Cyperus entrerianus* Boeck., disturbed, i, 2960

Cyperus fraternus Kunth, prairie, r, 2896

**Cyperus haspan* L., wetlands, o, 2676

Cyperus pseudovegetus Steud. var. *pseudovegetus*, wetlands, i, 2898

Cyperus reflexus Vahl, prairie, r, 2865

Cyperus retrorsus Chapm. var. *retrorsus*, pimple mounds, i, 3586

Cyperus virens Michx. var. *virens*, wetlands, o, 2900

†*Eleocharis compressa* Sull. var. *acutisquamata* (Buckley) S.G. Sm., wetlands, f, 2911

Eleocharis microcarpa Torr. var. *microcarpa*, wetlands, i, 2832

Eleocharis montana (Kunth) Roem. & Schult., wetlands, i, 2846

Eleocharis palustris (L.) Roem. & Schult., wetlands, r, 2922

Eleocharis quadrangulata (Michx.) Roem. & Schult., wetlands, i, 2980

†*Eleocharis wolfii* (A. Gray) A. Gray ex Britton, wetlands, r, 2910

Fimbristylis puberula (Michx.) Vahl var. *puberula*, prairie, a, 2815

Rhynchospora caduca Elliott, wetlands, f, 2907

Rhynchospora corniculata (Lam.) A. Gray, wetlands, o, 2839

Rhynchospora globularis (Chapm.) Small, wetlands, f, 2816

Rhynchospora recognita (Gale) Kral, prairie, o, 2957

Scleria ciliata Michx. var. *elliottii* (Chapm.) Fernald, wetlands, o, 3370

†*Scleria muhlenbergii* Steud., wetlands, r, 3122

Scleria oligantha Michx., prairie, i, 2840

Scleria pauciflora Muhl. ex Willd. var. *pauciflora*, prairie, o, 3711

Hypoxidaceae

Hypoxis hirsuta (L.) Coville, pimple mounds, prairie, i, 2698

Iridaceae

Herbertia lahue (Molina) Goldblatt, prairie, i, 2755

Iris brevicaulis Raf., wetlands, r, 2852

Sisyrinchium angustifolium Mill., disturbed, i, 2825

Sisyrinchium minus Engelm. & A. Gray, disturbed, i, 2749

Juncaceae

Juncus acuminatus Michx., wetlands, o, 2871

Juncus brachycarpus Engelm., wetlands, o, 2818

Juncus effusus L. var. *solutus* Fernald & Wiegand, wetlands, i, 2847

- †*Juncus elliotii* Chapm. var. *elliotii*, wetlands, i, 2817
Juncus marginatus Rostk., wetlands, o, 2814
Juncus nodatus Coville, wetlands, o, 2918
Juncus tenuis Willd. var. *dichotomus* (Elliott) Alph. Wood, wetlands, i, 2854

Marantaceae

- Thalia dealbata* Fraser ex Roscoe, wetlands, i, 3372

Orchidaceae

- Spiranthes vernalis* Engelm. & A. Gray, prairie, i, 2945

Poaceae

- Agrostis elliotiana* Schult., pimple mounds, o, 2743, C₃
Agrostis hyemalis (Walter) Britton, Sterns & Poggenb. var. *hyemalis*, pimple mounds, f, 2738, C₃
Andropogon gerardii Vitman subsp. *gerardii*, prairie, f, 3120, C₄
Andropogon glomeratus (Walter) Britton, Sterns & Poggenb. var. *glomeratus*, wetlands, i, 3148, C₄
Andropogon ternarius Michx. var. *ternarius*, prairie, f, 2662, C₄
Aristida purpurascens Poir. var. *purpurascens*, prairie, o, 2673, C₄
Axonopus fissifolius (Raddi) Kuhlm., prairie, pimple mounds, wetlands, f, 2944, C₄
Axonopus furcatus (Flüggé) Hitchc., wetlands, i, 3152, C₄
†**AT** *Bothriochloa exaristata* (Nash) Henrard, prairie, o, 3151, G3S3, C₄
Bothriochloa longipaniculata (Gould) Allred & Gould, disturbed, prairie, i, 3012, C₄
Bouteloua curtipendula (Michx.) Torr. var. *curtipendula*, prairie, r, 3128, C₄
**Briza minor* L., disturbed, i, 2770, C₃
**Chloris cantherae* Arechav. var. *cantherae*, disturbed, i, 2758, C₄
**Cynodon dactylon* (L.) Pers. var. *dactylon*, disturbed, i, 3149, C₄
Dichanthelium aciculare (Desv. ex Poir.) Gould & C.A. Clark subsp. *aciculare*, prairie, i, 2711, C₃
Dichanthelium aciculare (Desv. ex Poir.) Gould & C.A. Clark subsp. *angustifolium* (Elliot) Freckmann & Lelong, prairie, f, 2741, C₃
Dichanthelium acuminatum (Sw.) Gould & C.A. Clark subsp. *acuminatum*, prairie, f, 2740, C₃
Dichanthelium dichotomum (L.) Gould subsp. *dichotomum*, prairie, i, 2912, C₃
Dichanthelium sphaerocarpon (Elliott) Gould, prairie, f, 2739, C₃
**Digitaria ciliaris* (Retz.) Koeler var. *ciliaris*, disturbed, i, 2988, C₄
Digitaria cognata (Schult.) Pilg., pimple mounds, o, 3583, C₄
Elymus virginicus L. var. *virginicus*, disturbed, r, 3658, C₃
Eragrostis elliotii S. Watson, pimple mounds, i, 3582, C₄
Eragrostis intermedia Hitchc. var. *intermedia*, prairie, o, 2952, C₄
Eragrostis lugens Nees, pimple mounds, o, 3584, C₄
Eragrostis refracta (Muhl. ex Elliott) Scribn., prairie, i, 3124, C₄
Eragrostis spectabilis (Pursh) Steud., prairie, o, 3583, C₄
Eriochloa contracta Hitchc., disturbed, i, 3008, C₄
AT *Hordeum pusillum* Nutt., disturbed, i, 2775, C₃
Leersia hexandra Sw., wetlands, r, 3042, C₃
Limnodea arkansana (Nutt.) L.H. Dewey, disturbed, i, 3376, C₃
**Lolium arundinaceum* (Schreb.) Darbysh., disturbed, i, 3348, C₃
**Lolium perenne* L. var. *perenne*, disturbed, o, 2705, C₃
Mnesithea cylindrica (Michx.) de Koning & Sosef [Sy = *Coelorchis cylindrica* (Michx.) Nash], wetlands, i, 3878, C₄
Muhlenbergia capillaris (Lam.) Trin., prairie, o, 3110, C₄
Nassella leucotricha (Trin. & Rupr.) R.W. Pohl, disturbed, i, 2849, C₃
Panicum anceps Michx. var. *anceps*, wetlands, i, 3471, C₄
AT *Panicum bergii* Arechav. [Sy = *Panicum pilcomayense* Hack.], pimple mounds, i, 3464, C₄
Panicum dichotomiflorum Michx. subsp. *dichotomiflorum*, disturbed, o, 3102, C₄
Panicum hemitomom Schult., wetlands, a, 2908, C₃
Panicum rigidulum Bosc ex Nees subsp. *rigidulum*, wetlands, o, 2672, C₄
Panicum tenerum Beyr. ex Trin., wetlands, o, 2872, C₄
Panicum virgatum L., wetlands, a, 3118, C₄
Paspalidium geminatum (Forsk.) Stapf var. *geminatum*, wetlands, i, 2951, C₄
Paspalum denticulatum Trin. [Sy = *P. lividum* Trin.], wetlands, f, 3423, C₄
**Paspalum dilatatum* Poir., disturbed, i, 2895, C₄
Paspalum floridanum Michx., wetlands, o, 3014, C₄
**Paspalum notatum* Flüggé, disturbed, i, 2989, C₄
Paspalum plicatulum Michx. var. *plicatulum*, prairie, a, 2905, C₄
Paspalum praecox Walter, wetlands, r, 3119, C₄
Paspalum setaceum Michx. var. *muhlenbergii* (Nash) D.J. Banks, prairie, i, 2954, C₄
**Paspalum urvillei* Steud., disturbed, i, 2894, C₄
AT *Paspalum wrightii* Hitchc. & Chase [Sy = *P. texanum* Swallen], wetlands, o, 2990, C₄
AT *Phalaris angusta* Nees ex Trin., disturbed, i, 2774, C₃
Phalaris caroliniana Walter, disturbed, o, 2769, C₃
**Poa annua* L., disturbed, i, 2694, C₃
Schizachyrium scoparium (Michx.) Nash var. *scoparium*, prairie, a, 3109, C₄
Setaria parviflora (Poir.) Kerguelen, disturbed, prairie, i, 2948, C₄
Sorghastrum nutans (L.) Nash, prairie, a, 3121, C₄
**Sorghum halepense* (L.) Pers., disturbed, i, 2893, C₄
Sphenopholis obtusata (Michx.) Scribn. var. *obtusata*, disturbed, i, 2855, C₃
Sporobolus compositus (Poir.) Merr. var. *compositus*, prairie, i, 3877, C₄
Sporobolus compositus (Poir.) Merr. var. *macer* (Trin.) Kartesz & Gandhi, pimple mounds, i, 3153, C₄
Sporobolus indicus (L.) R. Br. var. *indicus*, disturbed, o, 2706, C₄
†*Sporobolus silveanus* Swallen, prairie, r, 3601, C₄
Steinchisma hians (Elliott) Nash, wetlands, o, 2946, C₃
Tridens strictus (Nutt.) Nash, wetlands, f, 3541, C₄
Tripsacum dactyloides (L.) L. var. *dactyloides*, wetlands, r, 2857, C₄

Urochloa platyphylla (Munro ex C. Wright) R.D. Webster, disturbed, i, 3879, C₄
Vulpia octoflora (Walter) Rydb. var. *octoflora*, pimple mounds, o, 2744, C₃

Pontederiaceae

Pontederia cordata L. var. *cordata*, wetlands, i, 2868

EUDICOTS

Acanthaceae

Hygrophila lacustris (Cham. & Schltdl.) Nees, wetlands, r, 3040
Justicia ovata (Walter) Lindau var. *lanceolata* (Chapm.) R.W. Long, wetlands, r, 3116
Ruellia humilis Nutt. var. *depauperata* Tharp & F.A. Barkley, prairie, o, 3043
Ruellia nudiflora (Engelm. & A. Gray) Urb. var. *nudiflora*, disturbed, o, 3006

Anacardiaceae

Toxicodendron radicans (L.) Kuntze, disturbed, i, 2877

Apiaceae

Chaerophyllum tainturieri Hook. var. *dasy carpum* (Nutt.) S. Watson, disturbed, r, 3603
Daucus pusillus Michx., mounds, r, 4090
Eryngium yuccifolium Michx., prairie, f, 2982
Hydrocotyle umbellata L., wetlands, i, 3375
Limnoscium pinnatum (DC.) Mathias & Constance, prairie, i, 2915
Polytaenia nuttallii DC., prairie, o, 2936
Sanicula canadensis L. var. *canadensis*, disturbed, r, 2856

Apocynaceae (incl. Asclepiadaceae)

†*Amsonia repens* Shinnery, wetlands, o, 2703
 †*Asclepias linearis* Scheele, wetlands, r, 3115
Asclepias longifolia Michx. subsp. *longifolia*, wetlands, i, 2943
Asclepias verticillata L., prairie, o, 2937
Asclepias viridis Walter, disturbed, i, 2833

Asteraceae

Acmella oppositifolia (Lam.) R.K. Jansen var. *repens* (Walter) R. K. Jansen, wetlands, i, 2861
Ambrosia psilostachya DC., prairie, o, 2666
Ambrosia trifida L. var. *texana* Scheele, disturbed, r, 3596
Arnoglossum plantagineum Raf., prairie, o, 2813
Astranthium integrifolium (Michx.) Nutt. subsp. *ciliatum* (Raf.) DeJong, pimple mounds, r, 3607
Boltonia diffusa Elliott var. *diffusa*, wetlands, f, 3106
Calyptocarpus vialis Less., disturbed, r, 3422
Cirsium horridulum Michx. var. *elliottii* Torr. & A. Gray, prairie, r, 2786
Conoclinium coelestinum (L.) DC., wetlands, o, 3129
Conyza canadensis (L.) Cronquist var. *glabrata* (A. Gray) Cronquist, pimple mounds, i, 3924
Coreopsis tinctoria Nutt. var. *tinctoria*, disturbed, o, 2892
Erigeron philadelphicus L., disturbed, i, 3347
Erigeron tenuis Torr. & A. Gray, prairie, f, 2708
Eupatorium lancifolium (Torr. & A. Gray) Small, prairie, r, 3925
Eupatorium serotinum Michx., disturbed, i, 3472
Euthamia gymnospermoides Greene, wetlands, f, 2663

Euthamia leptoccephala (Torr. & A. Gray) Greene ex Porter & Britton, prairie, i, 3543
Gamochaeta purpurea (L.) Cabrera [Sy = *Gnaphalium purpureum* L.], disturbed, o, 2751
Gutierrezia texana (DC.) Torr. & A. Gray var. *texana*, prairie, i, 2670
Helenium amarum (Raf.) H. Rock var. *amarum*, disturbed, i, 2669
Helenium flexuosum Raf., wetlands, o, 2897
Helianthus angustifolius L., wetlands, a, 3469
Helianthus maximiliani Schrad., wetlands, r, 3592
 **Hypochaeris microcephala* (Sch. Bip.) Cabrera var. *albiflora* (Kuntze) Cabrera, disturbed, i, 2748
Iva annua L., prairie, r, 3931
Krigia cespitosa (Raf.) K.L. Chambers, pimple mounds, r, 3609
Krigia dandelion (L.) Nutt., pimple mounds, i, 2696
Liatris acidota Engelm. & A. Gray, prairie, f, 3111
 †*Liatris bracteata* Gaiser, prairie, r, 3101, G2G3S2S3
Liatris pycnostachya Michx., prairie, f, 2904
Mikania scandens (L.) Willd., wetlands, i, 3117
Packera glabella (Poir.) C. Jeffrey, prairie, i, 2716
Pityopsis graminifolia (Michx.) Nutt., pimple mounds, r, 3660
Pluchea baccharis (Mill.) Pruski, wetlands, i, 3928
Pyrrhopappus pauciflorus (D. Don) DC., disturbed, i, 2845
Ratibida columnifera (Nutt.) Wooton & Standl., disturbed, r, 3421
Rudbeckia hirta L. var. *angustifolia* (T.V. Moore) Perdue, pimple mounds, i, 2834
 †*Rudbeckia texana* (Perdue) P.B. Cox & Urbatsch, wetlands, f, 2983
Silphium gracile A. Gray, prairie, pimple mounds, f, 2822
Solidago canadensis L. var. *scabra* (Muhl. ex Willd.) Torr. & A. Gray, prairie, i, 3544
Solidago stricta Aiton, prairie, pimple mounds, f, 2671
Solidago tortifolia Elliott, prairie, pimple mounds, f, 3610
 †*Soliva sessilis* Ruiz & Pav., disturbed, r, 2867
Symphotrichum dumosum (L.) G. L. Nesom, prairie, pimple mounds, i, 2664
Symphotrichum ericoides (L.) G. L. Nesom var. *ericoides*, prairie, pimple mounds, i, 2665
Symphotrichum lanceolatum (Willd.) G. L. Nesom var. *lanceolatum*, wetlands, o, 3589
Symphotrichum patens (Aiton) G.L. Nesom var. *gracile* (Hook.) G. L. Nesom, prairie, r, 3597
Symphotrichum pratense (Raf.) G. L. Nesom, prairie, pimple mounds, r, 3104
Vernonia missurica Raf., wetlands, f, 3927

Boraginaceae

Lithospermum incisum Lehm., prairie, r, 2715
Myosotis macrosperma Engelm., wetlands, r, 3656

Brassicaceae

Lepidium densiflorum Schrad. var. *densiflorum*, disturbed, i, 3349
Lepidium virginicum L. var. *medium* (Greene) C.L. Hitchc., disturbed, o, 2823
Lepidium virginicum L. var. *virginicum*, disturbed, o, 2783

Callitrichaceae

Callitriche peploides Nutt., wetlands, i, 2761

Campanulaceae

Lobelia puberula Michx., prairie, i, 2667

Triodanis lamprosperma McVaugh, disturbed, i, 2874

Triodanis perfoliata (L.) Nieuwl. var. *biflora* (Ruiz & Pav.) Bradley, prairie, pimple mounds, o, 2752

Triodanis perfoliata (L.) Nieuwl. var. *perfoliata*, prairie, pimple mounds, o, 2736

Caryophyllaceae

Cerastium glomeratum Thuill., prairie, i, 2709

Cistaceae

Lechea mucronata Raf., prairie, i, 2986

Clusiaceae

Hypericum hypericoides (L.) Crantz, prairie, r, 3712

Convolvulaceae

Dichondra carolinensis Michx., prairie, pimple mounds, i, 2750

Evolvulus sericeus Sw. var. *sericeus*, prairie, i, 3011

Ipomoea cordatotriloba Dennst., disturbed, i, 3007

Cornaceae

Cornus drummondii C.A. Mey., disturbed, i, 2880

Cuscutaceae

Cuscuta pentagona Engelm., wetlands, r, 3041

Droseraceae

Drosera brevifolia Pursh, pimple mounds, i, 2734

Ebenaceae

Diospyros virginiana L., disturbed, r, 2853

Euphorbiaceae

Acalypha gracilens A. Gray var. *gracilens*, prairie, r, 22178 (WRC)

**Caperonia palustris* (L.) A. St.-Hil., wetlands, r, 3930

Chamaesyce maculata (L.) Small, disturbed, o, 3127

Croton capitatus Michx. var. *lindheimeri* (Engelm. & A. Gray) Müll. Arg., disturbed, o, 2675

Croton glandulosus L. var. *lindheimeri* Müll. Arg., prairie, pimple mounds, o, 3045

Euphorbia bicolor Engelm. & A. Gray, disturbed, o, 3046

Euphorbia spathulata Lam., prairie, pimple mounds, o, 2757

†*Euphorbia texana* Boiss., prairie, pimple mounds, i, 2737

Tragia betonicifolia Nutt., pimple mounds, o, 2941

**Triadica sebifera* (L.) Small (= *Sapium sebiferum* (L.) Roxb.), wetlands, f, 2921

Fabaceae

Acacia angustissima (Mill.) Kuntze var. *hirta* (Nutt. ex Torr. & A. Gray) B.L. Rob., prairie, pimple mounds, o, 2891

Baptisia bracteata Muhl. ex Elliott var. *leucophaea* (Nutt.) Kartesz & Gandhi, prairie, i, 2902

Baptisia sphaerocarpa Nutt., prairie, f, 2837

Centrosema virginianum (L.) Benth., disturbed, i, 3015

Chamaecrista fasciculata (Michx.) Greene, disturbed, o, 2981

Dalea candida Willd. var. *candida*, prairie, i, 2959

Desmodium ciliare (Muhl. ex Willd.) DC. var. *ciliare*, pimple mounds, o, 3105

Galactia marginalis Benth., pimple mounds, r, 3112

Lathyrus pusillus Elliott, disturbed, i, 2753

**Medicago lupulina* L., disturbed, o, 2693

**Medicago minima* (L.) L., disturbed, i, 2844

**Melilotus indicus* (L.) All., disturbed, i, 2843

Mimosa hystricina (Small ex Britton & Rose) B.L. Turner, prairie, o, 2835

Mimosa nuttallii (DC.) B.L. Turner, prairie, o, 2938

Neptunia lutea (Leavenw.) Benth., wetlands, o, 2939

Neptunia pubescens Benth. var. *pubescens*, wetlands, r, 22175 (WRC)

Sesbania drummondii (Rydb.) Cory, wetlands, r, 3044

Stylosanthes biflora (L.) Britton, Sterns & Poggenb., prairie, r, 2953

Tephrosia onobrychoides Nutt., pimple mounds, o, 2942

**Trifolium repens* L. var. *repens*, disturbed, i, 2890

Vicia ludoviciana Nutt. ex Torr. & A. Gray subsp. *ludoviciana*, disturbed, i, 3604

Fagaceae

Quercus virginiana Mill. var. *virginiana*, disturbed, r, 2987

Gentianaceae

Sabatia campestris Nutt., pimple mounds, prairie, o, 2830

Geraniaceae

Geranium carolinianum L. var. *carolinianum*, disturbed, o, 2784

Haloragaceae

^{AT}*Proserpinaca palustris* L. var. *amblyogona* Fernald, wetlands, f, 2772

Hydrophyllaceae

Hydrolea ovata Nutt. ex Choisy, wetlands, f, 2999

Krameriaceae

Krameria lanceolata Torr., prairie, r, 3420

Lamiaceae

Hedeoma hispidum Pursh, prairie mounds, i, 2756

Physostegia intermedia (Nutt.) Engelm. & A. Gray, wetlands, o, 2850

Salvia lyrata L., disturbed, i, 3346

Scutellaria parvula Michx. var. *parvula*, pimple mounds, o, 2710

Linaceae

Linum medium (Planch.) Britton var. *texanum* (Planch.) Fernald, prairie, f, 2903

Lythraceae

^{AT?}*Cuphea glutinosa* Cham. & Schltdl., prairie, r, 3714

Lythrum alatum Pursh var. *lanceolatum* (Elliott) Rothr., wetlands, i, 2947

Malvaceae

Callirhoë involucrata (Torr. & A. Gray) A. Gray var. *lineariloba* (Torr. & A. Gray) A. Gray, prairie, o, 2836

Modiola caroliniana (L.) G. Don, disturbed, i, 2776

Sida ciliaris L., disturbed, i, 3010

Sida rhombifolia L., disturbed, i, 3009

Melastomataceae

Rhexia mariana L. var. *mariana*, wetlands, i, 2984

Myricaceae

Morella cerifera (L.) Small, prairie, i, 3264

Onagraceae

Gaura longiflora Spach, disturbed, o, 3039

Ludwigia glandulosa Walter, wetlands, o, 2901

Ludwigia linearis Walter, wetlands, i, 2985

Oenothera laciniata Hill, pimple mounds, i, 2735

Oenothera linifolia Nutt., prairie, r, 2785

Oenothera speciosa Nutt., disturbed, o, 2782

Oxalidaceae

Oxalis dillenii Jacq., disturbed, o, 2781

Oxalis violacea L., prairie, r, 3154

Passifloraceae

Passiflora incarnata L., disturbed, o, 2914

Plantaginaceae

Plantago aristata Michx., disturbed, o, 2841

Plantago virginica L., disturbed, i, 2826

Polemoniaceae

Phlox cuspidata Scheele, prairie, r, 2787

Polygalaceae

Polygala incarnata L., pimple mounds, prairie, f, 2828

Polygonaceae

Polygonum hydropiperoides Michx., wetlands, f, 2674

Rumex chrysocarpus Moris, disturbed, i, 2883

Primulaceae

Anagallis minima (L.) E.H.L. Krause, pimple mounds, f, 2714

Ranunculaceae

Anemone berlandieri Pritz., pimple mounds, i, 2699

Delphinium carolinianum Walter, pimple mounds, i, 2821

Ranunculus laxicaulis (Torr. & Gray) Darby, wetlands, r, 3605

Ranunculus pusillus Poir., wetlands, i, 2760

†*Thalictrum texanum* (A. Gray) Small, pimple mounds, r, 2701, G2QS2

Rosaceae

Prunus angustifolia Marsh. var. *angustifolia*, disturbed, i, 2879

Rubus argutus Link, disturbed, i, 2876

RUBIACEAE

Cephalanthus occidentalis L. var. *californicus* Benth., wetlands, r, 3933

Diodia virginiana L. var. *virginiana*, wetlands, i, 2920

Galium obtusum Bigelow subsp. *obtusum*, wetlands, i, 2759

Houstonia pusilla Schoepf, pimple mounds, f, 2689

Rutaceae

Zanthoxylum clava-herculis L., disturbed, i, 3371

Salicaceae

Salix nigra Marshall, wetlands, r, 2869

Saxifragaceae

†*Lepuropetalon spathulatum* Elliott, pimple mounds, r, 2702

Scrophulariaceae

Agalinis heterophylla (Nutt.) Small ex Britton, prairie, f, 3107

Agalinis viridis (Small) Pennell, prairie, o, 3103

Buchnera americana L., pimple mounds, prairie, o, 2831

Castilleja indivisa Engelm., pimple mounds, prairie, f, 2692

Gratiola virginiana L. var. *virginiana*, wetlands, i, 2762

Mecardonia acuminata (Walter) Small var. *acuminata*, wetlands, r, 3123

Nuttallanthus canadensis (L.) D.A. Sutton [Sy = *Linaria canadensis* (L.) Dum. Cours.], disturbed, i, 2704

Solanaceae

Physalis cinerascens (Dunal) Hitchc. var. *cinerascens*, pimple mounds, i, 2771

Ulmaceae

Ulmus americana L., wetlands, r, 3373

Valerianaceae

Valerianella woodsiana (Torr. & A. Gray) Walp., disturbed, o, 2780

Verbenaceae

Phyla nodiflora (L.) Greene, disturbed, i, 2913

Verbena halei Small, prairie, o, 2754

**Verbena brasiliensis* Vell., disturbed, i, 2863

Verbena xutha Lehm., prairie, r, 3419

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